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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/542,865	SIRAT ET AL.	
	Examiner	Art Unit	
	BRYAN GIGLIO	2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 May 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *428-430,432-440,442-460,462-472 and 475-479* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *470,471,475,477 and 479* is/are allowed.

6)☒ Claim(s) *428-430,432-437,439,440,442-445,447-450,452-460,462-469,472,476 and 478* is/are rejected.

7)☒ Claim(s) *438,446 and 451* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 July 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to claims 428-430, 432-437, 439-445, 447-450, 452-460, 462-465, 467-469, and 476 have been considered but are moot in view of the new ground(s) of rejection.

Specifically, Applicant argues that the addition of the limitation "birefringent crystal" is cosmetic only (see *Remarks*, page 16, paragraphs 3-4), however Applicant points out (see *Remarks*, page 16, paragraph 5) that "Funk *et al*. do not disclose...birefringent crystal", which means that the limitation is further limiting in order to render Funk *et al*. no longer anticipatory. Therefore, any new rejection is considered necessitated by amendment.

Applicant's additional arguments that Funk *et al*. does not provide *prima facie* evidence of anticipation is not persuasive. Whereas the claims are given their broadest reasonable interpretation in the application of prior art under 35 U.S.C 102, limitations like "determine at least one spectral component" are very broad, and the determination may be of, for example, an intensity, a polarization, a frequency/wavelength, an absorption, etc, anywhere in a spectrum of light, spectral component being so broad as to mean the entire visible spectrum, for example. Decoding, as claimed, is also very broad, and Funk *et al*. clearly sets forth a method of decoding in order to determine light intensity versus wavelength using frequency modulation decoding. Finally, the limitation "analyzing light" is in the preamble and carries no patentable weight.

Applicant's arguments with respect to claims 472 have been considered but are moot in view of the new ground(s) of rejection. Furthermore it is pointed out that the "communications system" aspects of the claim exists only in the preamble, and as such they carry no patentable weight. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a

structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).

Applicant's arguments, see *Remarks*, page 19-20, filed 2/25/2008, with respect to claim 466 rejected under 35 U.S.C. 103 in view of Official Notice, have been fully considered and are not persuasive. Applicant argues that the further decrease from the "for instance" resolution of 20 picometers in Funk *et al*. would not have been obvious because such and enhancement spans more than an order of magnitude, and involves optical considerations other than "simple alignment of multiple elements". The Examiner contends that "simple alignment" is not mentioned at any point by the Examiner, but rather the Examiner's argument is that a *person having ordinary skill in the art* would have understood from the teachings of Funk *et al*. that the process disclosed may "for instance" result in sub 20 picometer resolution, since 20 picometer resolution was only mentioned as an example of the result of the Funk *et al*. technique for enhancing its own resolution. In regard to order of magnitude argument, the original description of the device set forth in column 4 of the Funk reference describes a liquid crystal device having 64 elements (see line 33), and a dispersion of "white-light" (see line 43) across this 64 element mask. White light is generally defined as the visible range from approximately 400nm to 700nm, a range of 300 nm. Spanned over a 64 element device, this means an approximate resolution of 4.6875 nm, or 4687.5 picometers. The method taught by Funk to enhance this resolution resulted in 20 picometers, "for instance". This is a difference of at least 2 orders of magnitude, and so surely the method taught by Funk, combined with ordinary skill in the art, is capable of enhancements by orders of magnitude. The rejection of claim 466 is maintained based on these arguments.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 432 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 432 depends from claim 431, which is cancelled. Therefore the scope of claim 432 cannot be determined and the claim is indefinite.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 428-430, 433-437, 439-440, 442-445, 447-450, 452, 454-457, 460, 462-465, 468, 472, 476, and 478 are rejected under 35 U.S.C. 102(b) as being anticipated by Nagai (U.S. Patent No. 5570180), newly cited.

In regard to claim 428, the Nagai reference teaches an apparatus for analyzing light having at least one wavelength, the apparatus comprising: (a) a light deflector for deflecting the light so as to provide a deflected light beam characterized by at least one wavelength-dependent angle (see figs. 1 or 6, element 4, “diffraction device”), respectively, corresponding to the at least one wavelength of the light; (b) an encoder (see figs. 1 or 6, element 60, “optical shutter array”), which comprises at least one birefringent crystal (see c.5, l.48-50, "PLZT (lead lanthanum zirconate titanate)"; and see c.6, l.7-8, “birefringence occurs”) and which is capable of encoding said deflected light beam so as to provide an encoded light beam

characterized by at least one angle-dependent polarization state (see c.6, and see c.10, l.9-20) , respectively, corresponding to said at least one wavelength-dependent angle (see figs. 1 or 6); and (c) a decoder, for decoding said encoded light beam so as to determine at least one spectral component of the light (see figs. 1 or 6, element 13, “SIGNAL PROCESSOR”).

In regard to claim 429, the Nagai reference teaches the apparatus serving as a component in a system or device selected from the group consisting of a wavelength amplifying system, an optical sensor (see figs. 1 and 6), a spectrograph (see figs. 1 and 6), an imaging spectrograph, a time- frequency spectrograph (see figs. 1 and 6), a telecentric imaging system, an optical storage medium, an optical communication system, a tunable laser system, a lithography system, an optical computing system and a fiber Bragg sensor.

In regard to claim 430, the Nagai reference teaches the apparatus serving for performing at least one operation selected from the group consisting of stabilizing laser radiation, monitoring optical pulses, modulating a light source (see figs. 1 and 6), discriminating between Raman emission and fluorescence, discriminating between different light sources, testing a multi-lasers test system, generating frequency multiplexed signals and sensing changes in environmental conditions, influencing said deflected light beam and/or said encoded light beam.

In regard to claim 433, the Nagai reference teaches the apparatus (d) a mechanism for varying at least one parameter representing at least one of said light deflector and said encoder so as to span a discrete basis of signals, each corresponding to one value of said at least one parameter (see element 7, “temperature sensor"; and see fig.3, and fig.15).

In regard to claim 434, the Nagai reference teaches the apparatus wherein said decoder is operable to use said discrete basis of signals for determining wavelengths (see fig.15, and determining wavelengths is inherent in a spectrometer).

In regard to claim 435, the Nagai reference teaches the apparatus further comprising a beam splitter, for splitting the light into two beams (see elements 4 and 301, which split light into many beams), each having a predetermined polarization (polarization is applied by element 60 in predetermined encoding pattern).

In regard to claim 436, the Nagai reference teaches the apparatus further comprising at least one polarization rotator, designed and configured so as to rotate a polarization of said deflected light beam and/or a polarization of said encoded light beam (see element 60; and see c.5, l.48-50, "PLZT (lead lanthanum zirconate titanate)"; and see c.6, l.7-8, “birefringence occurs”).

In regard to claim 437, the Nagai reference teaches the apparatus wherein said light deflector is selected from the group consisting of a grating and a prism (see c.5, l.19-20, “prism, diffraction grating, or the like”).

In regard to claim 439, the Nagai reference teaches the apparatus wherein said encoder is operable to generate at least one angle-dependent polarization phase-shift, thereby to provide said polarization state or said polarization states (see c.6, l.5-55).

In regard to claim 440, the Nagai reference teaches the apparatus wherein said encoder is calibrated so as to generate a zero or small polarization phase-shift for a predetermined set of wavelengths and a non-zero polarization phase-shift for wavelengths other than said predetermined set of wavelengths (see c.2, l.60-67).

In regard to claim 442, the Nagai reference teaches the apparatus further comprising a first mechanism for varying said angle-dependent polarization phase-shift (see fig.3, “drive device”).

In regard to claim 443, the Nagai reference teaches the apparatus wherein said first mechanism is operable to rotate said at least one birefringent crystal about an axis, so as to vary said angle-dependent polarization phase-shift (see fig.28).

In regard to claim 444, the Nagai reference teaches the apparatus further comprising a first polarization rotator, for rotating a polarization of said deflected light beam from a first polarization orientation to a second polarization orientation (see elements 8, 10 and 60).

In regard to claim 445, the Nagai reference teaches the apparatus wherein said first polarization rotator is designed and constructed such that said second polarization orientation substantially equals an orientation of said at least one birefringent crystal (see c.2, l.60-67 and see elements 8, 10 and 60, and fig.28).

In regard to claim 447, the Nagai reference teaches the apparatus wherein said first mechanism is operable to generate a further deflection of the deflected light beam, said further deflection being time-dependent so that said angle-dependent polarization phase-shift varies (see c.2, l.60-67).

In regard to claim 448, the Nagai reference teaches the apparatus wherein said first mechanism is operable to vary an effective length of said at least one birefringent crystal, thereby to vary said angle-dependent polarization phase-shift (see c.6, l.15-30; see element 60; see c.5, l.48-50, "PLZT (lead lanthanum zirconate titanate)"; and see c.6, l.7-8, “birefringence occurs”).

In regard to claim 449, the Nagai reference teaches the apparatus wherein said first mechanism is capable of applying a voltage on said at least one birefringent crystal, thereby to vary said effective length (see c.6, l.15-30).

In regard to claim 450, the Nagai reference teaches the apparatus wherein a shape of said at least one birefringent crystal is selected such that when said first mechanism applies a translational motion thereto, said effective length is varied (see c.6, l.15-30).

In regard to claim 452, the Nagai reference teaches the apparatus further comprising at least one additional geometrical crystal filter, for polarizing the light prior to impinging of the light on said light deflector (see figs1 or 6, element 8).

In regard to claim 454, the Nagai reference teaches the apparatus wherein said decoder is capable of generating a representative time-delay for each polarization state, and using said representative time-delay for determining said at least one spectral component of the light (see fig.13, 14, and 17; and see c.14, l.53-59).

In regard to claim 455, the Nagai reference teaches the apparatus wherein said decoder comprises: (i) a temporal polarization phase-shifter, communicating with an external clock, and capable of accumulating a time-dependent polarization phase-shift to said encoded light beam; and (ii) a polarization phase-shift analyzer, capable of analyzing said time-dependent polarization phase-shift so as to provide an optical signal having a time-dependent intensity, corresponding to said time-dependent polarization phase-shift (see figures 10-14, description of linked shutter array and signal processor).

In regard to claim 456, the Nagai reference teaches the apparatus wherein said decoder further comprises an optical converter, for converting said optical signal to electrical signal (see element 12).

In regard to claim 457, the Nagai reference teaches the apparatus further comprising at least one filter for filtering a portion of the light, prior to an impingement on said deflector, said encoder and/or said decoder (see figs.2C, 7C, or 8C, element 65, “blocking filter").

In regard to claim 460, the Nagai reference teaches the apparatus further comprising a low-resolution optical device, for determining a low-resolution spectral range of the light, said low-resolution optical device being characterized by a spectral resolution which is lower than a spectral resolution of said decoder (see fig.9, and see c.10, l.43-58).

In regard to claim 462, the Nagai reference teaches the apparatus wherein said low-resolution optical device comprises an additional geometrical crystal filter, and further wherein a free spectral range of said additional geometrical crystal filter is different than a free spectral range of said at least one birefringent crystal (see c.10, l.43-58).

In regard to claim 463, the Nagai reference teaches the apparatus wherein said free spectral range of said additional geometrical crystal filter is substantially larger than said free spectral range of said at least one birefringent crystal (see fig.9, and see c.10, l.43-58, free spectral range will depend on which shutter is considered and whether a prism (non-linear) or grating (linear) is used)).

In regard to claim 464, the Nagai reference teaches the apparatus wherein said low-resolution optical device is capable of directly using said at least one wavelength-dependent angle so as to determine said low-resolution spectral range (see fig.9, and see c.10, l.43-58, free spectral range will depend directly on which shutter is considered and whether a prism (non-linear) or grating (linear) is used).

In regard to claim 465, the Nagai reference teaches the apparatus wherein said low-resolution optical device is a position sensing device, whereby a position of said deflected light beam corresponds to a respective wavelength-dependent angle (see fig.9, and see c.10, l.43-58, free spectral range will depend on which shutter is considered and whether a prism (non-linear) or grating (linear) is used, and result of prism/grating is spatially based frequency modulation which is ultimately decoded such that position correlates exactly with frequency)..

In regard to claim 468, the Nagai reference teaches the apparatus wherein the apparatus is characterized by a total analysis time of from about 1 nanosecond to a few hours (inherent, extremely broad claim).

In regard to claim 472, the Nagai reference teaches a communications system having a multiplexing apparatus for generating an optical signal characterized by a plurality of wavelengths and a de-multiplexing apparatus, for extracting said information from the optical signal, the de-multiplexing apparatus comprising: (a) a light deflector for deflecting the light so as to provide a deflected light beam characterized by a plurality of wavelength-dependent angles (see figs. 1 or 6, element 4, “diffraction device”), respectively, corresponding to the plurality of wavelengths of the optical signal; (b) an encoder (see figs. 1 or 6, element 60, “optical shutter array”), capable of generating at least one angle-dependent polarization phase-shift in said deflected light beam so as to provide an encoded light beam characterized by a plurality of angle-dependent polarization phase-shift (see c.6, and see c.10, l.9-20), respectively; corresponding to said plurality of wavelength-dependent angles; and (c) a decoder, for determining the plurality of wavelengths of the optical signal based on said plurality of polarization phase-shifts (see figs. 1 or 6, element 13, “SIGNAL PROCESSOR”).

In regard to claim 476, the Nagai reference teaches a method of analyzing light having at least one wavelength, the method comprising: (a) deflecting the light so as to provide a deflected light beam characterized by at least one wavelength-dependent angle (see figs. 1 or 6, element 4, “diffraction device”), respectively, corresponding to the at least one wavelength of the light; (b) encoding (see figs. 1 or 6, element 60, “optical shutter array”) said deflected light beam using at least one birefringent crystal (see c.5, l.48-50, "PLZT (lead lanthanum zirconate titanate)"; and see c.6, l.7-8, “birefringence occurs”) so as to provide an encoded light beam characterized by at least one angle-dependent polarization state (see c.6,

and see c.10, l.9-20), respectively, corresponding to said at least one wavelength- dependent angle; and (c) decoding said encoded light beam so as to determine at least one spectral component of the light (see figs. 1 or 6, element 13, "SIGNAL PROCESSOR").

In regard to claim 478, the Nagai reference teaches the method of sensing changes in environmental conditions affecting a wavelength of light, the method comprising executing the method of claim 476 for determining wavelength changes in the light, thereby sensing the changes in environmental conditions (see previous citations, and see c.8, l.25-34, "environmental conditions" is very broad language).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 428-430, 433-437, 439, 440, 442-445, 447-450, 452-460, 462-465 and 467-469 are rejected under 35 U.S.C. 103(a) as being unpatentable over Funk, et al. (U.S. Patent No. 6031609), previously cited, in view of Nagai, newly cited above.

In regard to claim 428, the Funk reference teaches an apparatus for analyzing light having at least one wavelength, the apparatus comprising: (a) a light deflector for deflecting the light so as to provide a deflected light beam characterized by at least one wavelength-dependent angle, respectively, corresponding to the at least one wavelength of the light (see ‘609, fig.1, element 16); (b) an encoder, capable of encoding said deflected light beam so as to provide an encoded light beam characterized by at least one angle-dependent polarization state (see ‘609, fig.1, LCD mask, with varying modulation of the angularly diffracted light), respectively, corresponding to said at least one wavelength-dependent angle (see ‘609, c.4, l.61-67); and (c) a decoder, for decoding said encoded light beam so as to determine at least one spectral component of the light (see ‘609, fig.1, elements 42, 46 and 48, DSP board).

The Funk reference is silent to the encoder comprising at least one birefringent crystal, per se. The Funk reference teaches a ferroelectric liquid crystal device. The Nagai reference, also applied to claim 428 above, teaches a substantially similar spectrometer comprising an encoder (see ‘180, figs. 1 or 6, element 60, “optical shutter array”), which comprises at least one birefringent crystal (see ‘180, c.5, l.48-50, "PLZT (lead lanthanum zirconate titanate)"; and see c.6, l.7-8, “birefringence occurs”). This birefringent crystal array is functionally equivalent to the liquid crystal array as taught by Funk, and would have been an obvious alternative to the LC device. The PLZT provides the benefit of a high electro-optical effect (see '180, c.5, 46-50).

Therefore, it would have been obvious to a person having ordinary skill in the art to which the subject matter pertains to substitute the LC array as taught by Funk with the functionally equivalent birefringent PLZT array as taught by Nagai in order to modulate the light according to the range of frequencies with a device having a high electro-optical effect.

In regard to claim 429, the Funk reference teaches the apparatus for analyzing light, serving as a component in a system or device selected from the group consisting of a wavelength amplifying system, an optical sensor (see fig.1), a spectrograph (see c.4, l.56-59), an imaging spectrograph (see c.4, l.49-53), a time-frequency spectrograph (see c.4, l.61-66), a telecentric imaging system, an optical storage medium, an optical communication system, a tunable laser system, a lithography system, an optical computing system and a fiber Bragg sensor.

In regard to claim 430, the Funk reference teaches the apparatus for analyzing light serving for performing at least one operation selected from the group consisting of stabilizing laser radiation, monitoring optical pulses, modulating a light source (see fig.1), discriminating between Raman emission and fluorescence (see c.4, l.56-59), discriminating between different light sources (see c.4, l.56-59), testing a multi-lasers test system, generating frequency multiplexed signals and sensing changes in environmental conditions, influencing said deflected light beam and/or said encoded light beam.

In regard to claim 433, the Funk reference teaches the apparatus for analyzing light further comprising: (d) a mechanism for varying at least one parameter representing at least one of said light deflector and said encoder so as to span a discrete basis of signals, each corresponding to one value of said at least one parameter (see fig.1, element 28).

In regard to claim 434, the Funk reference teaches the apparatus for analyzing light wherein said decoder is operable to use said discrete basis of signals for determining wavelengths (see c.4, l.61-66).

In regard to claim 435, the Funk reference teaches the apparatus for analyzing light further comprising a beam splitter, for splitting the light into two beams, each having a predetermined polarization (see fig.1, element 36).

In regard to claim 436, the Funk reference teaches the apparatus for analyzing light further comprising at least one polarization rotator, designed and configured so as to rotate a polarization of said deflected light beam and/or a polarization of said encoded light beam (see fig.1, LCD mask, and see elements 22 and 26).

In regard to claim 437, the Funk reference teaches the apparatus for analyzing light wherein said light deflector is selected from the group consisting of a grating and a prism (see c.4, l.26-28).

In regard to claim 439, the Funk reference teaches the apparatus for analyzing light wherein said encoder is operable to generate at least one angle-dependent polarization phase-shift, thereby to provide said polarization state or said polarization states (see c.4, l.61-67, LCD phase shifts light between elements 22 and 26).

In regard to claim 440, the Funk reference teaches the apparatus for analyzing light wherein said encoder is calibrated so as to generate a zero or small polarization phase-shift for a predetermined set of wavelengths and a non-zero polarization phase-shift for wavelengths other than said predetermined set of wavelengths (see c.4, l.61-67, shift is time varying between 0 and pi/2 radians).

In regard to claim 442, the Funk reference teaches the apparatus for analyzing light further comprising a first mechanism for varying said angle-dependent polarization phase-shift (see fig.1, element 28).

In regard to claim 443, the Funk reference teaches the apparatus for analyzing light wherein said first mechanism is operable to rotate said at least one birefringent crystal about an axis, so as to vary said angle-dependent polarization phase-shift (see c.4, l.31-38, rotation of optical-axis properties is inherent).

In regard to claim 444, the Funk reference teaches the apparatus for analyzing light further comprising a first polarization rotator, for rotating a polarization of said deflected light beam from a first polarization orientation to a second polarization orientation (see c.4, l.31-38, inherent as combined).

In regard to claim 445, the Funk reference teaches the apparatus for analyzing light wherein said first polarization rotator is designed and constructed such that said second polarization orientation substantially equals an orientation of said at least one birefringent crystal (see c.4, l.31-38, inherent as combined).

In regard to claim 447, the Funk reference teaches the apparatus for analyzing light wherein said first mechanism is operable to generate a further deflection of the deflected light beam, said further deflection being time-dependent so that said angle-dependent polarization phase-shift varies (see c.4, l.61-67).

In regard to claim 448, the Funk reference teaches the apparatus for analyzing light wherein said first mechanism is operable to vary an effective length of said at least one birefringent crystal, thereby to vary said angle-dependent polarization phase-shift (see c.4, l.31-38, inherent as combined).

In regard to claim 449, the Funk reference teaches the apparatus for analyzing light wherein said first mechanism is capable of applying a voltage on said at least one birefringent crystal, thereby to vary said effective length (see c.4, l.31-38, inherent as combined).

In regard to claim 450, the Funk reference teaches the apparatus for analyzing light wherein a shape of said at least one birefringent crystal is selected such that when said first mechanism applies a translational motion thereto, said effective length is varied (see c.4, l.31-38, inherent as combined).

In regard to claim 452, the Funk reference teaches the apparatus for analyzing light further comprising at least one additional geometrical crystal filter, for polarizing the light prior to impinging of the light on said light deflector (see fig.1, element 22).

In regard to claim 453, the Funk reference teaches the apparatus for analyzing light wherein said decoder is capable of splitting said encoded light beam into two secondary polarized light beams, and calculating a contrast function between said two secondary polarized light beams (see fig.1, elements 36, 42, 46, and 48, and see fig.2).

In regard to claim 454, the Funk reference teaches the apparatus for analyzing light wherein said decoder is capable of generating a representative time-delay for each polarization state, and using said representative time-delay for determining said at least one spectral component of the light (phase change in the liquid crystal is a type of time delay, changing propagation speed, at various frequencies for each wavelength).

In regard to claim 455, the Funk reference teaches the apparatus for analyzing light wherein said decoder comprises: (i) a temporal polarization phase-shifter, communicating with an external clock, and capable of accumulating a time-dependent polarization phase-shift to said encoded light beam; and (ii) a polarization phase-shift analyzer, capable of analyzing said time- dependent polarization phase-shift so as to provide an optical signal having a time- dependent intensity, corresponding to said time-dependent polarization phase-shift (see fig.1 and 2, all phase shift information is carried by the time dependency of the signal frequencies, and the DSP is coupled to computer, while the modulator is couple to a frequency controller, or type of clock, to control temporal phase shifting)

In regard to claim 456, the Funk reference teaches the apparatus wherein said decoder further comprises an optical converter, for converting said optical signal to electrical signal (see fig.1, detectors).

In regard to claim 457, the Funk reference teaches the apparatus further comprising at least one filter for filtering a portion of the light, prior to an impingement on said deflector, said encoder and/or said decoder (see c.3, l.46-47).

In regard to claim 458, the Funk reference teaches the apparatus for analyzing light further comprising a first anamorphic prism, positioned so as to reduce a spot size of the light prior to impingement of the light on said deflector (see fig.1, element 30).

In regard to claim 459, the Funk reference teaches the apparatus for analyzing light further comprising a second anamorphic prism, positioned so as to increase angular dispersion of said deflected light beam, prior to impingement of said deflected light beam on said decoder, thereby to optimize a wavelength resolution (see c.6, l.51-56).

In regard to claim 460, the Funk reference teaches the apparatus for analyzing light further comprising a low-resolution optical device, for determining a low-resolution spectral range of the light, said low resolution optical device being characterized by a spectral resolution which is lower than a spectral resolution of said decoder (see fig.1, element 42, single PMT).

In regard to claim 462, the Funk reference teaches the apparatus for analyzing light wherein said low-resolution optical device comprises an additional geometrical crystal filter, and further wherein a free spectral range of said additional geometrical crystal filter is different than a free spectral range of said at least one birefringent crystal (see fig.1, element 22 and 26, polarizers, which would inherently be different from a liquid crystal device which changes constantly with time, and where resonance is not being detected because cavities are too large to effect wavelength, or variable to effect polarization. “different” is broad.).

In regard to claim 463, the Funk reference teaches the apparatus for analyzing light wherein said free spectral range of said additional geometrical crystal filter is substantially larger than said free spectral

range of said at least one birefringent crystal (see fig.1, element 22 and 26, polarizers, which would inherently be different from a liquid crystal device which changes constantly with time, and where resonance is not being detected because cavities are too large to effect wavelength, or variable to effect polarization. “substantially larger” is broad.).

In regard to claim 464, the Funk reference teaches the apparatus for analyzing light wherein said low-resolution optical device is capable of directly using said at least one wavelength-dependent angle so as to determine said low-resolution spectral range (see fig.1, LC element determines range based on its size and number of elements, and the angle light strikes it).

In regard to claim 465, the Funk reference teaches the apparatus for analyzing light wherein said low-resolution optical device is a position sensing device, whereby a position of said deflected light beam corresponds to a respective wavelength-dependent angle (see fig.1, result of prism/grating is spatially based frequency modulation which is ultimately decoded such that position correlate exactly with frequency).

In regard to claim 467, the Funk reference teaches the apparatus for analyzing light wherein the apparatus is characterized by a sub nanometer resolution (see c.6, l.55-56).

In regard to claim 468, the Funk reference teaches the apparatus for analyzing light wherein the apparatus is characterized by a total analysis time of from about 1 nanosecond to a few hours (see c.6, l.34-43).

In regard to claim 469, the Funk reference teaches the apparatus wherein the apparatus is characterized by a detectivity of from about -80 db to about -0 db (see c.4, l.53-55, inherent in 1P28A PMT).

Claim 466 is rejected under 35 U.S.C. 103(a) as being unpatentable over Funk in view of Nagai as cited above, in view of Official Notice of well know practice in the art.

The Funk and Nagai combination teaches all of the elements of claim 428 from which claim 466 depends, as cited above. The reference is silent to the apparatus characterized by a sub picometer resolution. Funk teaches that a plurality of dispersive optics may be used in series to increase resolution, and states as example resolutions as small as 20 picometers (see c.6, l.51-56). Official notice is hereby taken that it would have been obvious to try to obtain higher resolution than 20 picometers using the exact same process of multiple elements, in order to permit expansion of a limited wavelength range over an LC mask surface. The Funk reference teaches a method multiple magnitude resolution as explained in the *Arguments* above, and a person having ordinary skill in the art would have been able achieve such resolutions with the teachings of Funk, as cited.

Therefore it would have been obvious to a person having ordinary skill in the art that additional dispersive elements could be used in the Funk reference to further increase spectral resolution to sub-picometer amounts in order to increase a limited wavelength range over an LC mask surface.

Allowable Subject Matter

Claims 470, 471, 475, 477, and 479 are allowed over the prior art of record.

Claims 438, 446, and 451 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims for the reasons set forth in the previous Office action (paper # 20070907).

Claims 470, 471, 475, and 477 are allowed for the reasons set forth in the previous Office action (paper # 20070907).

Claim 479 is allowed for the reasons set forth in the previous Office action (paper # 20070907) in regard to claim 438, which limitations are included in claim 479.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRYAN GIGLIO whose telephone number is (571)270-1028. The examiner can normally be reached on M-F, 7:30AM-5:00PM EST, Alt. Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Toatley can be reached on (571)272-2059. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/B. G./
Examiner, Art Unit 2877

/Gregory J. Toatley, Jr./
Supervisory Patent Examiner, Art Unit 2877
09 Jun 08